Socioeconomic determinants of rates of consultation in general practice based on fourth national morbidity survey of general practices

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Abstract

***Objective*—To identify the socioeconomic determinants of consultation rates in general practice.**

***Design*—Analysis of data from the fourth national morbidity survey of general practices (MSGP4) including sociodemographic details of individual patients and small area statistics from the 1991 census. Multilevel modelling techniques were used to take account of both individual patient data and small area statistics to relate socioeconomic and health status factors directly to a measure of general practitioner workload.**

***Results*—Higher rates of consultations were found in patients who were classified as permanently sick, unemployed (especially those who became unemployed during the study year), living in rented accommodation, from the Indian subcontinent, living with a spouse or partner (women only), children living with two parents (girls only), and living in urban areas, especially those living relatively near the practice. When characteristics of individual patients are known and controlled for the role of "indices of deprivation" is considerably reduced. The effect of individual sociodemographic characteristics were shown to vary between different areas.**

***Conclusions*—Demographic and socioeconomic factors can act as powerful predictors of consultation patterns. Though it will always be necessary to retain some local planning discretion, the sets of coefficients estimated for individual level factors, area level characteristics, and for practice groupings may be sufficient to provide an indicative level of demand for general medical services. Although the problems in using socioeconomic data from individual patients would be substantial, these results are relevant to the development of a resource allocation formula for general practice.**

Introduction

For both primary and secondary care there is a well established association between deprivation measured in terms of census variables at the area level and various indices of rates of use of general medical services[1,2] and hospital and community health services.[3,4] Interpretation of this work has been bedevilled by two problems: the extent to which supply of medical services might affect demand[5] and the ecological fallacy (the extent to which associations between socioeconomic characteristics of a small area and utilisation rates may not hold for individual patients).[6,7]

The fourth national morbidity survey of general practice (MSGP4),[8] the fourth decennial survey organised by the Royal College of General Practitioners in conjunction with the Office of Population Censuses and Surveys, affords the opportunity to combine an analysis at the individual patient level with data from small areas thereby improving our understanding of the relations between the different needs components, the consultation behaviour of an individual patient, and how these may vary across areas. This complements the analysis of these data already published, which has concentrated on identifying patterns of morbidity rather than workload.[8]

Methods

DETERMINANTS OF USE

The decision to consult a general practitioner is complex; it depends not only on a person's "objective need" to consult (morbidity status) and their propensity to consult given their "objective need" but also on the availability and type[9] of services and possibly the characteristics of the local community.[10,11] The provision and supply of extra services and staff, however, may potentially induce demand. Estimation of the demand in this "chicken and egg" situation requires appropriate statistical techniques. This was an important consideration in the analysis of the health needs at the small area level for hospital and community health services[12] and may be important in a similar analysis at area level for primary care.[13,14] This is not a problem here because the way in which an individual patient consults is unlikely to affect overall general practitioner or practice behaviour.

DATA AVAILABLE FOR ANALYSIS

Data were collected by 60 volunteer practices between September 1991 and August 1992 on consultations by all patients fully registered for part or whole of the study period (n=502 493). Results are presented here on workload measured by all consultations.[15]

A socioeconomic questionnaire was administered during the study to all patients on the 60 practice lists regardless of whether or not they had consulted during the study period and was completed by about 83%.[8] These questions are a subset of those in the census and provide basic sociodemographic information on age, sex, ethnicity, marital-cohabitation status, whether or not a sole parent, economic position last year and last week, occupation sufficient to generate the registrar general's social class classification, and housing tenure. Because loss of employment[16] is seen as important and given the difficulty of empirically disentangling the effects of economic position last week and last year, change in employment status during the study year was also used in the analysis. Whether or not the patient was registered as "permanently sick" was the only direct measure of morbidity. The box shows the codes used in multivariate analysis.

The individual data were supplied together with the following small area statistics from the 1991 census: housing tenure, social class, unemployment status, permanent sickness, student status, car ownership, single carer households, dependent children, elderly living alone, overcrowded households, educational qualifications, and limiting longstanding illness. A rural-urban ward classifier was used, and access variables were also calculated to represent the distance from the centroid of the enumeration district where each patient lived to the centroid of the enumeration district of her or his practice.

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Coding of variables

	Coded/treated as
Sociodemographic	
Age*:	
In 5 year age groups 0-4, 5-9, . . ., ⩾85	2, 7, . . ., 87
Ethnicity:	
Originally coded white, black, Indian/Pakistani/Bangladeshi, other	Baseline category is white. Separate binary variables for: • Black • Indian/Pakistani/Bangladeshi • Other (mostly Chinese)
Health status:	
Currently permanently sick (from employment status)	0—Not permanently sick 1—Permanently sick
Smoker or not	0—Non-smoker 1—Smoker
Dependency status:	
Dependent child	0—No dependent 1—Dependents
Sole adult	0—Not sole adult 1—Sole adult
Cohabitation status	0—Not cohabiting 1—Cohabiting
Socioeconomic status	
Registrar General's social class I, II, IIIN, IIIM, IV, V	0—Non-manual 1—Manual
Housing tenure	0—Non-owner occupier 1—Owner occupier
Change in employment status (derived from economic position last week and last year)	Baseline category is "employed throughout," separate binary variables for: • Unemployed to employed • Employed to unemployed • Unemployed • Other categories
Accessibility	
Distance from centroid of enumeration district of residence to centroid of enumeration district where practice is located (maximum 21 km)	In kilometres
Rurality	0—Rural 1—Urban

*For age groups 0-14, employment status, social class, and tenure status are those of the child's parents.

For reasons of confidentiality small area statistics were not supplied to us for enumeration districts and wards that were sparsely represented in the study population. In total 1640 districts and 480 wards were identified. Omission of unidentifiable districts resulted in the loss of a third of the sample and introduced an unacceptable level of bias. This was not true for excluded wards and hence these were used as the level for attributing small area census data to individual patients.

For the same reasons, although practice level characteristics were supplied, individual practices were not identified; instead the 60 practices were combined into 19 groups of three or four practices according to the number of doctors per 10 000 patients, the number of nurses in the practice, and whether the practice was a training practice or a dispensing practice. Practice effects were modelled as 18 binary dummy variables contrasted against the first grouping, which consisted of three practices with no trainees, no nurses, no dispensing facilities, and relatively small numbers of doctors per 10 000 patients.

STATISTICAL METHODS

Only those participating in the study for the full duration of the year were included in the analysis. For better specification six models were estimated separately for males and females aged 0 to 14, 15 to 64, and 65 and over.

The structure of the population modelled was hierarchical with individual patients located within geographical areas (electoral wards of residence) within general practices, but given that only 19 practice groupings were identified, the latter was not used as a separate level in the analysis. Where the data are clustered the assumptions of ordinary least squares regression analysis are not met as the residuals are correlated: parameter estimates of explanatory variables will be biased and SEs underestimated so that confidence intervals will be too narrow. Associations may be reported as significant when they ought not to be.

Multilevel models—which extend linear regression to deal with variability at several levels in the study design—have been developed explicitly to account for clustering of data.[17,18] In addition to allowing for variations in the conventional ordinary least squares slope and intercept according to each ward of residence, multilevel modelling also allows for systematic exploration of the ways in which social or geographical characteristics, or both, and practice "style" of an area affect consultation behaviour. This is an important innovation.

Workload is measured by the number of consultations by each patient during the study year. Given the count distribution (for males: 35% had no consultations, 17% one consultation, 5% five consultations, 6% 10 or more consultations[15]) a Poisson or negative binomial functional form of a multilevel model is appropriate,[19] and the latter was chosen after experiments with fitting samples of data. The general form of the multilevel model used is explained elsewhere.[17]

In a negative binomial regression there is an exponential relation between the dependent variable (the number of consultations an individual patient makes) and the explanatory variables which, therefore, cannot be viewed as simple coefficients of impact. The size of the estimated coefficients together with their associated sign, however, indicate both the relative magnitude of the effect of each variable and the direction of association with the response. Estimation is constrained so that the number of predicted consultations cannot be less than zero.

All individual and census level variables were initially included in the model and a stepwise elimination procedure ($P > 0{\cdot}05$, t test) was then used. Once a set of fixed individual explanatory variables had been identified, the residuals were analysed to identify any systematic patterns in consultation rates across the wards.

Results

Table 1 gives the breakdown of rates of consultations by the socioeconomic variables in the different age-sex groups. The results are, in general, consistent with previous analyses.[8] Table 2 gives the multilevel regression results. The presentation here concentrates on the themes common to all six models.

Patients classified as permanently sick consulted much more frequently. The associated coefficient was much larger than the others in the model particularly among men. The effect was unsurprising given that this was the only direct measure of health status in the dataset.

Change in employment status affected consultation behaviour.[20,21] This appeared for both men and women and also for boys (although with smaller magnitude). For adults, the continuously employed (baseline category) consulted the least, while those who had lost employment during the year were generally among the most frequent consulters.[16,22,23] Higher rates of consultations were also found among the other employment categories, which may be due to the inclusion of students and the permanently sick within this group.

Ethnicity is associated with differences in consulting patterns.[24 25] Among adults, patients of Indian, Pakistani, and Bangladeshi origin consulted most frequently, although, after other variables were controlled for, the effect was significant only for women; a similar pattern was seen for children but in this case, the significant increase was found only among boys. "Other" ethnic minority groups (mostly Chinese) consulted less frequently than their white counterparts for women but more frequently for boys.

Men who smoked consulted more, although the positive association tended to decrease in size with increasing age. Indeed, for elderly people of both sexes smoking was associated with a general decrease in consulting.

Women who were cohabiting (including married) consulted more frequently, mostly because of increased consultations associated with family planning and pregnancy. Among elderly women those cohabiting consulted less frequently, although this effect was restricted to non-owner occupiers.

Owner occupiers (or children of owner occupying parents) generally consulted less frequently than non-owner occupiers.[8 26] The effect was largest for elderly women.

Distance to practice and rurality both reflect acces-

Table 1—*Mean consultation rates per year for different socioeconomic variables in different sex and age groups (n > 200 000 for all variables)*

	Tenure		Occupational social class		Change in employment*					Ethnic group				Area		Cohabitation		Dependent child§		Smoking	
Sex-age group	Rented	Owner-occupier	Manual	Non-manual	Employed continuously	Unemployed continuously	Employed to unemployed	Unemployed to employed	Other†	White	Black	Asian‡	Other	Urban	Rural	Yes	No	Yes	No	Yes	No
Males:																					
0-15 years	3·37	3·03	3·27	2·98	3·07	3·19	3·42	3·23	3·49	3·11	3·31	3·93	3·29	3·02	2·74	NA	NA	3·11	3·14	NA	NA
16-64 years	3·48	2·63	3·20	2·50	2·49	3·17	3·22	2·72	4·57	2·84	2·89	3·62	2·55	2·51	2·21	2·97	2·59	2·47	3·07	3·05	2·74
>65 years	5·92	5·22	5·56	5·36	NA	NA	NA	NA	NA	5·40	6·42	5·33	4·47	5·10	4·99	5·40	5·64	NA	NA	4·83	5·66
Females:																					
0-15 years	3·65	3·08	3·39	3·09	3·18	3·28	3·56	3·74	3·64	3·25	2·95	3·56	3·12	3·14	2·94	NA	NA	3·34	3·25	NA	NA
16-64 years	6·20	4·70	5·65	4·66	4·76	5·84	5·95	5·68	5·57	5·08	5·88	5·60	4·71	4·82	4·09	5·09	5·09	5·16	5·06	5·67	4·86
>65 years	6·36	5·72	6·08	5·89	NA	NA	NA	NA	NA	5·95	6·63	5·46	4·33	5·61	5·35	5·82	6·03	NA	NA	5·63	6·00

*For children this is for their fathers and mothers. †Includes permanently sick. ‡Indian, Pakistani, Bangladeshi. §For children this is living with sole adult. NA=not applicable.

Table 2—*Socioeconomic variables predicting consultations for any reason by multilevel regression*

	Age 0-14		Age 15-64		Age ≥65	
Variable*	Male (n=37 468)	Female (n=35 711)	Male (n=100 612)	Female (n=69 247)	Male (n=20 213)	Female (n=26 717)
Individual variables						
Intercept	1·65¶	1·79¶	0·18‡	1·47¶	0·57§	−2·9§
Change in employment status:						
Unemployed-employed	0·01		0·09‡	0·04		
Employed-unemployed	−0·03		0·19¶	0·13¶		
Unemployed-unemployed	−0·04		0·11§	0·09§		
Other employment status	0·05‡		0·21¶	0·08¶		
Age:						
Age	−0·234¶	−0·23¶	−0·004	−0·02¶	0·01¶	0·1¶
Age squared	0·01¶	0·01¶	0·0003¶	0·0002¶		−0·0007§
Tenure status:						
Owner occupiers		−0·07§	−0·13¶	−0·15¶	−0·08§	−0·74§
Social class:						
Manual	0·06§	0·04§	0·09¶	0·09¶		
Health status:						
Permanently sick		0·1‡	1·74¶	0·67¶	0·27§	0·35§
Cohabiting status:						
Cohabiting†				0·03‡		−0·07§
Smoking status:						
Smoker			0·17§		−0·16¶	−0·06§
Dependency:						
Dependent child			−0·03§			
Sole adult		−0·12§				
Ethnicity:						
Black	−0·06			0·05		
Indian/Pakistani/Bangladeshi	0·35¶			0·21§		
Other (mostly Chinese)	0·06			−0·07		
Distance		−0·02‡			−0·02‡	
Rurality:						
Urban	0·14§			0·09§		
Interaction terms:						
Age×sole adult		0·02§				
Urban×distance	−0·03§			−0·03§		
Age×smoker			−0·004¶			
Age×owner occupier						0·01§
Permanently sick×age			−0·02¶			
Cohabitation×owner occupier						0·10§
Area variables:						
% Household without access to a car			0·007¶	0·008§		
% Owner occupiers					0·02‡	
Unemployment rate				−0·12‡		
Long standing illness in adult females				0·02‡		
% Dependent children in non-earning households						0·004§

*Sets of dummy variables are tested for overall significance with F test.
†Cohabiting includes those who are married and living together.
‡*t* Values between 2 and 3.
§*t* Values between 3 and 6.
¶*t* Values of greater than 6.

Table 3—*Rates of consultation for low, typical, and high consulters defined by individual and area characteristics. Illustration of the effects of 40 year old women**

Detail	Low	Typical	High
Individual effects:			
Employment status	Continuous employed	Continuous employed	Employed to unemployed
Ethnicity	Other (mostly Chinese)	White	Indian, Pakistani, or Bangladeshi
Tenure status	Owner occupier	Owner occupier	Not owner occupier
Social class	Non-manual	Non-manual	Manual
Cohabiting status	Single	Cohabiting	Cohabiting
Permanent sickness	No	No	Yes
Type of area	Rural	Urban	Urban
Area characteristics:			
% Households without car	0	21	65
Unemployment rate	39	8	0
Long standing illness	0·5	3	10
Rates of consultation	1·3	3·9	29·0

*Low, typical, and high consulters were in different practice groupings.

Table 4—*Change in number of consultations for any reason due to single variables**

Detail	Change in employment	Ethnic group	Tenure status	Social class	Permanently sick	Cohabitation status
Low	0·12†	0·29‡	0·21	0·12	1·27	0·04
High	−3·42§	−7·10¶	−4·02	−2·45	−14·21	−0·89

*These effects are not additive; they show the effect of changes in single variables among patients who otherwise have characteristics of lowest and highest consulters as described in table 3.
†Change to other employment. §Change to continuously employed.
‡Change to Indian, Pakistani, Bangladeshi. ¶Change to other (mostly Chinese).

sibility, and for girls and elderly men particularly, those living nearer consulted more. In addition, women and boys living in urban areas consulted more than their rural counterparts, but again, within the urban area, those living nearer consult more.

Previous studies have shown that children of single mothers are more likely to consult[27-29] and that children whose parents have divorced experience poorer health than children whose parent has been widowed.[30] In these analyses the effect of having a sole parent was found to be significant for girls only, the direction being towards less frequent attendance at the surgery.

Significantly less frequent consultations were also found for fathers with dependent children compared with fathers with no dependent children, though there was no apparent effect for mothers of dependent children. The results do not support previous suggestions on the relation between single parenthood and morbidity.[30]

Because individual level effects were controlled for, one would not expect many additional area effects to be significant, and indeed only the percentage of households without access to a car and the percentage of owner occupiers appeared significantly in more than one of the six age-sex groups (more detail on these and practice effects are given elsewhere[15]).

Discussion

These models provide substantial discrimination, but because of the complex model specification used a r^2 type measure is difficult to interpret. An illustration for low, typical, and high consulters among 40 year old women, however, is provided in tables 3 and 4. The predicted rates of consultation vary substantially from 1·3 to 29·0 (table 3). Moreover, changes in single variables have a substantial impact. For example, "high" consulters with all the characteristics defined in column 3 of table 3, except that the head of household is non-manual rather than manual, would have 2·5 fewer expected consultations than a manual equivalent (table 4).

Though there was highly significant variation between areas in each of the six age-sex models, for a typical patient the overall effect is not large, accounting for between 2% and 8% of total unexplained variation. For children and adults, however, the coefficients of age, housing tenure status, and distance from practice were found to vary significantly across electoral wards, and for elderly men the effects of housing tenure varied between areas.[15] The results imply, for example, that owner occupiers in one area may have notably more or fewer consultations than owner occupiers with the same socioeconomic and health characteristics belonging to another area.This type of variation may therefore play an important part in determining general practitioner workload, and hence it is important to retain some local planning discretion.

These analyses have identified socioeconomic characteristics measured at both the individual and area level associated with the number of consultations presenting at general practitioner practices sampled across England and Wales. Generally, the results of the models support previous research linking individual "deprivation" characteristics and morbidity, although there are some differences especially in respect of ethnicity and of the "social support" variables such as cohabitation status and lone parenthood. The former may be due to the bias introduced by interviews in the English language and the latter may reflect the decreasing salience of marital status to social position and vulnerability.

While the kind of area variables which appear as

Key messages

- There are important effects of age, social class, unemployment, housing status, marital status, and ethnicity on consulting patterns in general practice
- Characteristics of individual patients are much more powerful predictors of consulting patterns than the characteristics of the areas in which patients live
- The effects of individual socioeconomic factors themselves vary in different geographical areas
- Resource allocation methods based on area of residence (for example, Jarman score) will always be inferior to an approach that takes into account the characteristics of individual patients

significant (for example, rates of car ownership and tenure status) are also similar to those identified in other studies, when modelled correctly in a multilevel framework, there are far fewer significant area effects: reliance on "indices of deprivation" will inevitably be very crude because individual characteristics are so much more powerful predictors of consulting behaviour.

The models described form a basis for estimating the demand for general practitioner services at the practice level. While the problems in using individual socioeconomic data would be substantial, it might be possible, by a combination of small area statistics, the sample of anonymised records, and age-sex registers, to provide a basis for an equitable distribution of resources in the primary as well as the secondary care sector.

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Commentary: The basis of a more rational method of funding primary medical care?

Azeem Majeed

Many previous studies investigating the association between socioeconomic factors and consultation rates in general practice have suffered from three limitations.

Firstly, many studies used socioeconomic data for areas rather than for individuals and the associations found in these studies may not hold at the individual level (the ecological fallacy).

Secondly, most previous studies have not taken into account the extent to which the provision of health services can generate demand for these services (supplier induced demand).

Thirdly, deprivation indices rather than separate socioeconomic variables have usually been used in the analyses.

In an innovative study investigating the association between socioeconomic factors and consultation rates in general practice, Roy Carr-Hill and colleagues used data from the fourth national survey of morbidity in general practice and ward census data in a multilevel statistical model. They then used this statistical model to try to disentangle the effect on consultation rates of the socioeconomic characteristics of individual patients (patient factors), the socioeconomic characteristics of the wards in which these patients lived (area factors), and the characteristics of the general practices with which these patients were registered (supply factors). Although many of their findings were probably to be expected, some important new findings did emerge from their study. For example, they showed that the socioeconomic characteristics of patients are a powerful predictor of consultation rates in general practice and that once individual characteristics are controlled for, area characteristics have little additional effect on consultation rates. Their other important finding was that the effect of socioeconomic factors on consultation rates varied between areas, implying that there should be some local discretion when resources such as deprivation payments to practices are allocated.

What are the implications of these results for the NHS? The main benefit of the work is that it is a major step towards the development of a more rational method of funding primary medical care services. These services have traditionally been funded on the basis of previous spending both at health commission level and general practice level, and this has led to inequities in funding.[1,2] As a result of this study, the socioeconomic determinants of consultation rates in general practice are now much clearer. Although the development of a formula to allocate resources to health commissions for primary medical care services was not a primary aim of their study, the findings will help inform the debate on how such a formula should

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